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March 30, 1999

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Box Patent Application

TRANSMITTAL LETTER LARGE ENTITY APPLICATION

Dear Sir:

Please find enclosed a patent application as follows:

Applicant(s): Folkert Horst, André Brousseau, Oleh Szklar and Luc Ethier

Title: METHOD AND APPARATUS FOR ASSIGNING ADDRESSES TO
COMPONENTS IN A CONTROL SYSTEM

Number of Pages for: Specification: 16 Claims: 7; No. Sheets Dwgs.: 6; No. Pages Abstract: 1;
Unexecuted Formal Papers: Combined Declaration and Power of Attorney; executed Assignment
and Preliminary Amendment.

| | |
|--|-------------------|
| Basic Fee: | \$760.00 |
| Additional Fees: | |
| Total Number of Claims in excess of 20 times \$18: 25-20=5 | 90.00 |
| Number of independent claims minus 3 times \$78: 6-3=3 | 234.00 |
| Multiple Dependent Claims (\$135): | .00 |
| Total Filing Fee | \$1,084.00 |

Please charge our Deposit Account No. 03-1721 **\$1,084.00** to cover the appropriate filing fees. Please charge any additional fees, and credits, to our Deposit Account No. 03-1721.

If this application is found otherwise to be INCOMPLETE, or if at any time it appears that a TELEPHONE CONFERENCE with counsel would helpfully advance prosecution, please telephone the undersigned at any time.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Folkert, *et al.* Examiner:
Serial No.: Art Unit:
Filing Date: March 30, 1999 Attorney Docket: 0690811-0007
Title: METHOD AND APPARATUS FOR ASSIGNING ADDRESSES TO
COMPONENTS IN A CONTROL SYSTEM

Assistant Commissioner of Patents
Washington, DC 20231

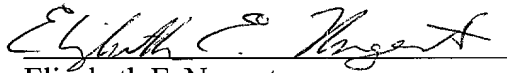
Sir:

PRELIMINARY AMENDMENT

On page 1, before "Field of the invention," please add --This application claims priority under 35 USC 119 to Canadian Application "Method and Apparatus for Assigning Addresses to Components in a Control System," (serial number not yet assigned), filed March 25, 1999, which is incorporated by reference herein.--

No new matter is entered by this amendment. Please charge any fees associated with this filing, or apply any credits, to our Deposit Account No. 03-1721.

Respectfully submitted,



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DS1 473013 1

Joint

**APPLICATION
FOR
UNITED STATES LETTER PATENT**

TO THE ASSISTANT COMMISSIONER FOR PATENTS:

BE IT KNOWN, that we, **Folkert Horst, André Brousseau, Oleh Szklar and Luc Ethier** have invented certain new and useful improvements in **METHOD AND APPARATUS FOR ASSIGNING ADDRESSES TO COMPONENTS IN A CONTROL SYSTEM** of which the following is a specification:

Title: Method and Apparatus for Assigning Addresses to Components in a Control System

5 **Field of the invention**

This invention relates to the field of communication and control systems. It is particularly applicable to a method and apparatus for assigning machine addresses to computer or
10 electronically controlled devices, and may be used to assign machine addresses to a control system using radio communication to transmit commands between a master controller and a slave controller.

15 **Background of the invention**

Electronic controllers are commonly used in the industry to regulate the operation of a wide variety of systems. In a specific example, electronic controllers are used to control
20 remotely vehicles such as locomotives in order to perform functions including braking, traction control and acceleration without the necessity of a human operator on board the locomotive. Radio frequency transmitter-receiver pairs are of particular interest for remotely controlling such vehicles.

25

In a typical locomotive control system, the operator communicates with a slave controller onboard the locomotive using a remote control device, herein designated as transmitter. The transmitter includes an electronic circuit placed in a
30 suitable casing that provides mechanical protection to the electronic components.

In use the operator of the locomotive enters requests into the transmitter via an input means such as a keyboard, touch

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screen or any other suitable input means. Typical requests may include brake, accelerate and any function that a locomotive may be required to perform. The transmitter encodes the request into a form suitable for transmission over a pre-determined
5 frequency link. Usually, a tag is appended to the request containing an identifier, herein designated as an address, unique to the remote control transmitter from which the request originates. The complete request is then modulated at the pre-determined radio frequency and transmitted as a RF signal.
10 Frequencies other than RF have also been used for this purpose.

Commonly, many transmitters may operate on the same radio frequency channel or on overlapping radio frequency channels often resulting in interference between the various signals.
15 Signals transmitted in overlapping frequency channels cannot be resolved into their respective signals by the slave controller. The interference of the signals typically causes requests to be lost. Consequently, a request is often transmitted continuously at a given repetition rate and each transmitter is assigned a
20 unique repetition rate. The unique repetition rate reduces the likelihood of messages interfering with one another. Many methods of assigning transmission rates are well known in the art to which this invention pertains. For an example of a method of assigning a repetition rate, the reader may refer to
25 U.S. Patent 4,245,347 by Hutton et al. whose content is hereby incorporated by reference.

Optionally, once the transmitter sends the RF signal, a repeater unit may receive the RF signal. Typical repeater units
30 are ground-based units whose function is to extend the radio frequency (RF) range of the transmitter of the remote control device by amplifying the signal and filtering noise components. Repeater units are well-known in the art to which this invention

pertains and typically comprise an RF antenna, an RF receiver, a decoder/encoder, an RF re-transmitter and any other equipment such as filters, duplexors and others required to receive a signal, process it and retransmit it. Commonly, the repeater
5 unit re-transmits the signal at a frequency different from the frequency used by the transmitter as well as sufficiently spaced in frequency from the frequency used by the transmitter such that the two signals can be resolved if they are received simultaneously by a receiver unit.

10

The slave controller onboard the locomotive receives and demodulates the RF signal originating from the transmitter or from the repeater unit. The signal is then decoded and the validity of the request is verified. The slave controller stores
15 an identifier indicative of the machine address of the transmitter assigned to the locomotive. The identifier is compared to the tag contained in the received demodulated request. Another operation in the verification of the signal involves verifying if the signal is intact by using a check sum
20 or other suitable error detection or correction algorithm. If the signal is valid it is then processed further so the command contained in the request can be implemented.

Locomotive control systems of the type described above
25 require the involvement of a human administrator that assigns and keeps a record of the various machine addresses of the transmitters in use. Generally, to assign an address to a transmitter or to a slave controller, dip switches within the transmitter and the slave controller are physically set. The
30 position of the dip switches defines the machine address assigned to the transmitter. Similarly, at the slave controller, dip switches are provided to define the address of the transmitter permitted to communicate with the receiver.

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Occasionally, such transmitters/receivers need to be replaced or temporarily removed from service to perform maintenance. For instance, in order to assign an address to a new transmitter module, the casing of the transmitter must be opened and the
5 dipswitches must be correctly set by the human operator. The setting is such that the machine address of the previous transmitter is duplicated on the new unit so the latter can communicate with the slave controller in the field.

10 The first problem with transmitter units of the type described above is the requirement to open the transmitter casing in order to access the dip switches. Such an operation, unless performed carefully can compromise the integrity of the casing. For example, if the casing is waterproof, opening it
15 may damage the watertight seal, thus increasing the risk of premature component failure.

20 The second problem with transmitter units of the type described above is the high reliance upon a technician to physically set the machine address by manipulating the dip switches. The reliance on an operator to assign addresses makes the system highly susceptible to human errors. For example, a technician may erroneously give two transmitter units the same machine address resulting in conflicting signals by setting the
25 dipswitches in the inappropriate position. Finally, a human operator is required to assign and manage the addresses of the transmitters in order to insure that no two transmitters are given the same address. Consequently, the assignment and management of addresses by an operator is a time consuming task
30 resulting in significant labour costs.

Thus, there exists a need in the industry to refine the process of assigning a machine address to a component of a

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5

For the purpose of this specification, the expressions "random" and "substantially random" are used to define a numerical pattern with very low correlation between its composing elements. In computer applications, random numbers are often generated using a mathematical formula that attempts to approach the "purely random" behaviour. However, in the context of this specification this expression should be given a broad interpretation to mean any non-numerically organised sequence of numbers or any other characters or symbols.

30 The address has two parts. One part is an identifier of the transmitter, the other part is an identifier from the slave controller. When these two parts are assembled, the combination forms a unique address for the pair transmitter/slave controller.

The operator programming unit is designed to communicate with one of the devices, say the slave controller to gather its identifier. Next, the operator programming unit communicates
5 with the other device, say the transmitter to transmit to it the identifier of the slave controller. Preferably, at the same time the operator programming unit gathers the identifier of the transmitter. Finally, the operator programming unit then communicates with the slave controller to communicate to it the
10 identifier of the transmitter. This procedure allows effecting an identifier exchange between the devices such that they all possess the same parts of the address. Accordingly, both the transmitter and the slave controller will have the same address information allowing interoperability to take place. In
15 addition, by automatically assigning unique identifiers to transmitters and slave controllers, a one-to-one correspondence between selected transmitter-slave pairs can be achieved.

The invention also provides a novel transmitter for use in
20 a remote control system featuring a dual part address, one part being proper to the transmitter and one part being proper to a slave controller to which the transmitter issues commands.

The invention yet provides a novel slave controller for use
25 in a remote control system featuring a dual part address, one part being proper to the slave controller and one part being proper to transmitter that issues commands to the slave controller.

30 Finally, the invention also provides a novel remote control system including a transmitter and a slave controller, the system using a dual part address to effect command validation.

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Brief description of the drawings

These and other features of the present invention will
 5 become apparent from the following detailed description
 considered in connection with the accompanying drawings. It is
 to be understood, however, that the drawings are provided for
 purposes of illustration only and not as a definition of the
 boundaries of the invention for which reference should be made
 10 to the appending claims.

Fig. 1 shows a simplified functional block diagram of a radio
 communication system including an embodiment of the invention;
 Fig. 2 shows a functional block diagram of a transmitter unit in
 15 accordance with the spirit of the invention;
 Fig. 3 shows a flow chart of a method in accordance with the
 invention for assigning a machine address to a transmitter unit;
 Fig. 4 is a structural block diagram of an apparatus in
 accordance with the invention for signal transmission in
 20 accordance with the invention;
 Fig. 5 shows a block diagram of the operator programming unit in
 accordance with the spirit of the invention;
 Fig. 6 shows a block diagram of the slave controller unit in
 accordance with the spirit of the invention.

25

Description of a preferred embodiment

In a preferred embodiment of this invention, the method for
 assigning an address to a communication component is used in a
 30 radio control system such as can be used in a locomotive control
 system. As shown in figure 1, the radio control system 100
 includes a set of functional units namely a portable transmitter
 104 and a slave controller 106 mounted on board the locomotive.

The transmitter has an interface allowing an operator 110 to enter commands. Typically, the interface includes a control panel with switches and levers allowing the operator 110 to remotely control the movement of the locomotive. Optionally, the radio control system may also include a repeater unit 102 to increase the effective operational range between the transmitter 104 and the slave controller 106.

The transmitter 104 generates command signals over an RF link 122 (or 116 and 118 if the repeater unit 102 is involved). The slave controller 106 receives the commands and implements them. The implementation procedure consists of generating the proper control signals and interfacing those control signals with main controller module 112 provided in the locomotive to regulate the operation of the engine, braking system and other devices.

The radio control system includes an operator-programming unit 108 (OPP) to program certain functions of transmitter 104 and the slave controller 106. The programming operation between the OPP 108 and the slave controller 106 is effected over a communication channel 126. The programming operation between the OPP 108 and the transmitter 104 is effected over a communication channel 120. The communication channel 120 is a wireless infrared link. Other communication channels are possible. For example the channel 120 between the operator programming unit 108 and the transmitter 104 may be based on RF communication. In a preferred embodiment, the controller module 112 and the OPP 108 communicate with the slave controller 106 via a standard asynchronous serial communication links 126 124 or any other suitable communication link.

The repeater unit 102 is a ground-based unit whose function is to extend the radio frequency (RF) range of the transmitter 104. In a specific example, the signal range is extended by 5 amplifying the signal and filtering noise components. Repeater units are well-known in the art to which this invention pertains and typically comprise an RF antenna, an RF receiver, a decoder/encoder, an RF re-transmitter and any other equipment such as filters, duplexors and others required to receive a 10 signal, process it and retransmit it. Preferably, the repeater unit re-transmits the signal at a frequency different and sufficiently spaced in frequency from the one used by the transmitter 104 such that the two signals can be resolved when the receiver unit 106 receives them.

15

In a specific example the radio frequencies used are between 806 MHz and 821 MHz (low band) or between 851 MHz and 866 MHz (High band) and frequencies are selected in pairs one from the low band and one from the high band. Any suitable 20 frequency band may be used here without detracting from the spirit of the invention. The transmitter unit 104 operates at a frequency selected from the low band and the repeater unit 102 retransmits at a frequency selected from the high band. Examples of three frequency pairs are 1) 812.5375 MHz and 25 857.5375 MHz, 2) 812.7875 MHz and 857.7875 MHz, 3) 818.900 MHz and 863.900 MHz.

The slave controller 106 receives and demodulates the RF signal originating from the transmitter 104 or from the repeater 30 unit 102. The signal is then decoded and the validity of the request is verified. The signal is first demodulated and the components of the message are extracted. In a specific example

the message contains a command section, a transmitter identifier section and a slave controller identifier. These components are extracted from the message in a known manner. The validity verification on the message then follows. This is a two-step operation. First, the slave controller 106 determines if the transmitter 104 transmitting the message is permitted to issue commands to the slave controller. Second the signal integrity is verified. The first verification step involves a comparison between the tag extracted from the message and the value stored in the memory of the slave controller. In typical locomotive control systems, a single transmitter can issue commands to a given locomotive. Generally, a memory element in the slave controller, such as a register stores an identifier indicative of the transmitter assigned to the locomotive. The identifier is compared to the tag extracted from the message. If both match, the slave controller concludes that the command is legitimate and proceeds with the remaining verification step. In the absence of match, the slave controller rejects the message and takes no action.

20

During the second verification step, the signal integrity is assessed. The signal is processed by a check sum assessment algorithm or by any other suitable error detection/correction algorithm. If the slave controller 106 finds that the message is indeed intact then the command that it contains is carried into effect.

The transmitter 104 of the radio control system is shown in more detail in figure 2. The transmitter 104 comprises a set of functional modules namely a user interface 201, a message builder unit 200, a message encoder 202 and a signal transmitting unit 218. The signal transmission unit 218 includes an input for receiving the signal to be transmitted. The signal

is supplied to a modulator 204 that modulates the signal and transfers it to a signal transmitter 206 that effects the actual transmission. The modulator is coupled to a modulating frequency generator 212. The signal transmitter 206 is coupled to a time interval duration control module 222. The time interval duration control module 222 stores data for controlling the time interval between two successive transmissions of the signal.

In a typical interaction, the user of the radio control system enters via the user interface 201 a command to be executed by the locomotive. The user interface may be a keyboard, touch screen, speech recognition system or any other suitable input means. In a preferred embodiment, the user interface 201 comprises a set of buttons or levers for each of the allowable actions namely brake, accelerate, reverse and so on. Once the command has been entered the message builder unit 200 processes it. The message builder unit 200 assembles the received command with an identifier for the transmitter as well as for the slave controller. These two identifiers are stored in computer readable storage media 210 and 208. Such computer readable storage media are in the form of a read-only memory (ROM), programmable read-only memory (PROM) modules, EPROM or any other suitable register devices. The command and the identifiers are digitally represented. Many message formats may be used here and the use of a particular message format does not detract from the spirit of the invention.

The transmitter unit includes an infrared interface 220 coupled to the memory units storing the identifiers 208 210. The IR interface receives address information via an IR link. In a specific example, the identifier information is sent by an operator programming unit 108 in the system. In an alternative

embodiment, an asynchronous transmission channel (e.g. RS232) can be used instead of the IR interface 220.

Each transmitter is assigned a unique transmission address. In a specific example, the transmission address, herein designated as address, assigned to the transmitter depends on the identifier assigned to the slave controller. The transmitter uses this address in the tag sent along with each message. In a preferred embodiment, the address is a compound data element including the slave controller identifier 208 and the transmitter identifier 210. In a specific example, the identifiers are the serial numbers of the respective components. Since a serial number is generally unique over all components, the address will be unique. Following this, the address is placed on the tag which is added to the message.

Optionally, once the message is created (the command including the tag), an encoding algorithm is applied by the message encoder 202 in order to reduce the occurrence of consecutive 0's or 1's in the message and therefore permit a self-synchronizing communication. Many encoding methods are known in the art of digital signal processing and the use of other encoding methods does not detract from the spirit of the invention.

25

Once the message has been created, the message is passed to the signal transmission unit 218, in particular to the modulator 204 that modulates the digital signal containing the message at the carrier frequency. In a preferred embodiment, the operator of the radio control unit may select the carrier frequency for the message. The carrier frequency generator 212 outputs the

selected carrier frequency. Following the modulation of the signal, a signal transmitter module 206 transmits the signal at predetermined time intervals. The time interval control module 222 controls the time interval between two successive signal transmission events.

The operator programming unit 108 is a module used for performing address synchronization between the transmitter 104 and the slave controller 106. The operator programming unit 108 is used to load the information representative of addresses into the memory of the transmitter 104 and the memory of the slave controller 106 units such as to uniquely define the pair.

As best shown in Figure 5, the operator programming unit comprises a memory unit 506 for storing identifier and programming information, a CPU 502, an IR interface 500, a serial interface 504 and a user interface 510. The CPU 502 interacts with the interfaces and the memory unit to perform functionalities related to programming the transmitter and slave controller devices, as will be discussed later. The IR interface 500 is used to communicate with the transmitter unit via an IR link. The serial interface is used to communicate with the slave controller via a serial communication link. Other interface configurations are possible without departing from the spirit of the invention. For example, both interfaces 500 504 may be IR interfaces or both may be serial interfaces. Furthermore, a single interface may be used to communicate with both the transmitter and the slave controller. Other variations are possible and will be readily apparent to the person skilled in the art.

The user interface 510 is suitable for receiving instructions from an operator to program a given transmitter/slave controller pair.

5 In a typical interaction, as shown in figure 3, at step 300, the operator programming unit 108 obtains the slave controller 106 identifier via a communication channel 126. This is effected by establishing a communication between the operator programming unit 108 and the slave controller 106 over the
10 communication channel 126. During this transaction, the slave controller 106 transmits to the operator programming unit its identifier. The OPP then transmits 302 the slave controller identifier to the transmitter unit 104 via the transmitter's infrared interface 120. The transmitter receives the identifier
15 information and stores it 304 in the appropriate computer readable medium 208. Following this the transmitter sends 306 its unique identifier to the OPP. In a specific example the unique identifier is the transmitter's serial number stored on a computer readable medium 210. The OPP receives the transmitter
20 identifier and transmits it 308 to the slave controller unit. The slave controller unit stores the transmitter's unique identifier on a computer readable medium 310 and the programming is complete. The next time the slave controller receives a message it will check the tag to see if it contains the correct
25 slave controller identifier and the correct transmitter unique identifier.

In an alternative embodiment, the transmitter and slave controller identifiers may be randomly generated and sent to the
30 respective components. The operations to generate the identifiers for the components of a communications system may be performed by a general-purpose digital computer using a CPU and

memory means as shown in figure 4. Such computing platform typically includes a CPU 402 and a memory 400 connected to the CPU by a data communication bus. The memory 400 stores the data 408 and the instructions of the program 404 implementing the functional blocks depicted in the drawing and described in the specification. That program 404 operates on the data 408 in accordance with the algorithms to generate the unique identifiers. Preferably the algorithms operate such that to insure that the identifiers generated are unique. For example, the apparatus may store on a computer readable medium the identifiers assigned thus far in a list, and may scan this list before assigning a new identifier to a component. The addresses are then loaded into PROMs in the transmitter and the receiver.

The steps depicted in figure 3 are implemented primarily by software. The program instructions for the software implemented functional blocks are stored in the memory portion 506.

As to the structure of the slave controller 106, as shown in figure 6, the latter comprises a receiver section 602 that senses the signal transmitted by the transmitter 104. The slave controller also comprises an interface 600 for interacting with the operator programming unit. In a specific example the interface 600 is a serial interface. The serial interface 600 is coupled to computer readable storage media 604 606 for storing the identifier of the transmitter unit associated with the slave controller and for storage a slave controller identifier. In addition the slave controller includes a logical processing station 608 to process the received signal and to generate the necessary control signals that are input to the locomotive controller module so the desired command can be implemented. The logical processing station 608 also performs the validation of a message received at the receiver 602.

Although the present invention has been described in considerable detail with reference to certain preferred embodiments thereof, variations and refinements are possible without departing from the spirit of the invention as have been described throughout the document. Therefore, only the appended claims and their equivalents should limit the scope of the invention.

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I claim:

1. An apparatus for transmitting a signal to a remote receiver,
5 said apparatus comprising:

a) a first input for receiving a certain signal to
be transmitted, said signal transmitting unit
being operative to transmit said signal;

10 b) a computer readable storage medium suitable for
storing a tag data element;

c) a second input coupled to said computer readable
storage medium for receiving a data element
indicative of a first identifier , said signal
transmitting unit being responsive to the
15 reception of a certain data element to store in
at least part of the tag data element an
electronic representation of the certain data
element indicative of the first identifier;

20 d) means for generating an output signal, said
output signal being derived on the basis of the
certain signal and on the basis of the tag data
element;

e) an output for outputting the output signal.

25 2. An apparatus as defined in claim 1, wherein said second input
comprises an interface suitable for wireless data
communication.

3. An apparatus as defined in claim 2, wherein said interface
30 suitable for wireless data communication is an infrared
interface.

4. An apparatus as defined in claim 3, wherein said first identifier is the receiver serial number.

5. An apparatus as defined in claim 1, wherein said tag data element comprising at least a first portion and a second portion, said certain data element indicative of a first identifier being stored in said first portion, said second portion containing a data element indicative of a second identifier, said second identifier being derived on the basis of an identifier associated to said apparatus.

6. A method for transmitting a signal to a remote receiver, said method comprising the steps of:

- a) receiving a certain signal to be transmitted;
- 15 b) providing a computer readable storage medium for storing a tag data element;
- c) receiving a data element indicative of a first identifier;
- 20 d) storing in at least part of the tag data element an electronic representation of the data element indicative of a first identifier;
- e) generating an output signal derived on the basis of the certain signal and on the basis of the tag data element;
- 25 f) outputting the output signal.

7. A method as defined in claim 6, further providing the step of providing an interface suitable for wireless data communication for receiving the a data element indicative of an first identifier.

8. A method as defined in claim 7, wherein said interface suitable for wireless data communication is an infrared interface.

5 9. A method as defined in claim 6, wherein said certain data element indicative of a first identifier is associated to the remote receiver.

10. A method as defined in claim 9, wherein said first
10 identifier is the receiver serial number.

11. A method as defined in claim 6, wherein said tag data element comprises at least a first portion and a second portion, said certain data element indicative of a first
15 identifier being stored in said first portion, said second portion containing a data element indicative of a second identifier, said second identifier being derived on the basis of a certain identifier associated to a certain component of a communication system.

20 12. A remote control system comprising:

- a transmitter for transmitting a signal indicative of an action to be performed remotely, said transmitter including:
 - 25 a) a first input for receiving a certain signal to be transmitted, said signal transmitting unit being operative to transmit said signal;
 - b) a computer readable storage medium suitable for storing a tag data element;
 - 30 c) a second input coupled to said computer readable storage medium for receiving a data element indicative of a first identifier, said signal transmitting unit being responsive to the

5 d) means for generating an output signal, said
output signal being derived on the basis of the
certain signal and on the basis of the tag data
element;

10 - a remote receiver for sensing said output signal and for
 implementing locally an action in dependence upon a
 contents of the output signal.

14. A system as defined in claim 12, further comprising a
programming unit, said programming unit being suitable to
transmit to the second input of said transmitter a data
element indicative of a first identifier.

16. A system as defined in claim 13, wherein said certain data
element indicative of a first identifier is associated to
30 the remote receiver.

17. A system as defined in claim 16, wherein said first identifier is the receiver serial number.

18. An apparatus as defined in claim 12, wherein said tag data element comprising at least a first portion and a second portion, said certain data element indicative of a first identifier being stored in said first portion, said second portion containing a data element indicative of a second identifier, said second identifier being associated to said transmitter.

19. A communication device suitable for use in a remote control system, said communication device comprising:

- a) a computer readable storage medium suitable for storing a tag data element;
- b) an input coupled to said computer readable storage medium for receiving a data element indicative of a first identifier, said signal communication device being responsive to the reception of a certain data element to store in at least part of the tag data element an electronic representation of the certain data element indicative of the first identifier;
- c) a means for generating an output signal, said output signal being derived at least in part on the basis of the tag data element;
- d) an output for outputting the output signal.

20. A communication device as defined in claim 19, wherein said tag data element comprises at least a first portion and a second portion, said certain data element indicative of a first identifier being stored in said first portion, said second portion containing a data element indicative of a second identifier, said second identifier being derived on

the basis of an identifier associated to said communication device.

5 21. A communication device suitable for use in a remote control system, said communication device comprising:

- a) means for storing a tag data element;
- b) means for receiving a data element indicative of an first identifier, said signal communication
10 device being responsive to the reception of a certain data element to store in at least part of the tag data element an electronic representation of the certain data element indicative of the first identifier;
- 15 c) means for generating an output signal, said output signal being derived at least in part on the basis of the tag data element;
- d) means for outputting the output signal.

20 22. A communication device as defined in claim 21, wherein said tag data element comprises at least a first portion and a second portion, said certain data element indicative of a first identifier being stored in said first portion, said second portion containing a data element indicative of a
25 second identifier, said second identifier being derived on the basis of an identifier associated to said communication device.

23. A method for assigning addresses in a communication system,
30 the communication system comprising a transmitter unit and a receiver unit, said method comprising the step of:

- providing a receiver identifier uniquely characterizing the receiver unit;

- providing a transmitter identifier uniquely characterizing the transmitter unit;
- deriving a transmission address on the basis of the receiver identifier and the transmitter identifier;
- 5 - providing the receiver unit and the transmitter unit with the transmission address.

24. A method as defined in claim 23, wherein said receiver identifier is the receiver serial number.

10

25. A method as defined in claim 23, wherein said transmitter identifier is the transmitter serial number.

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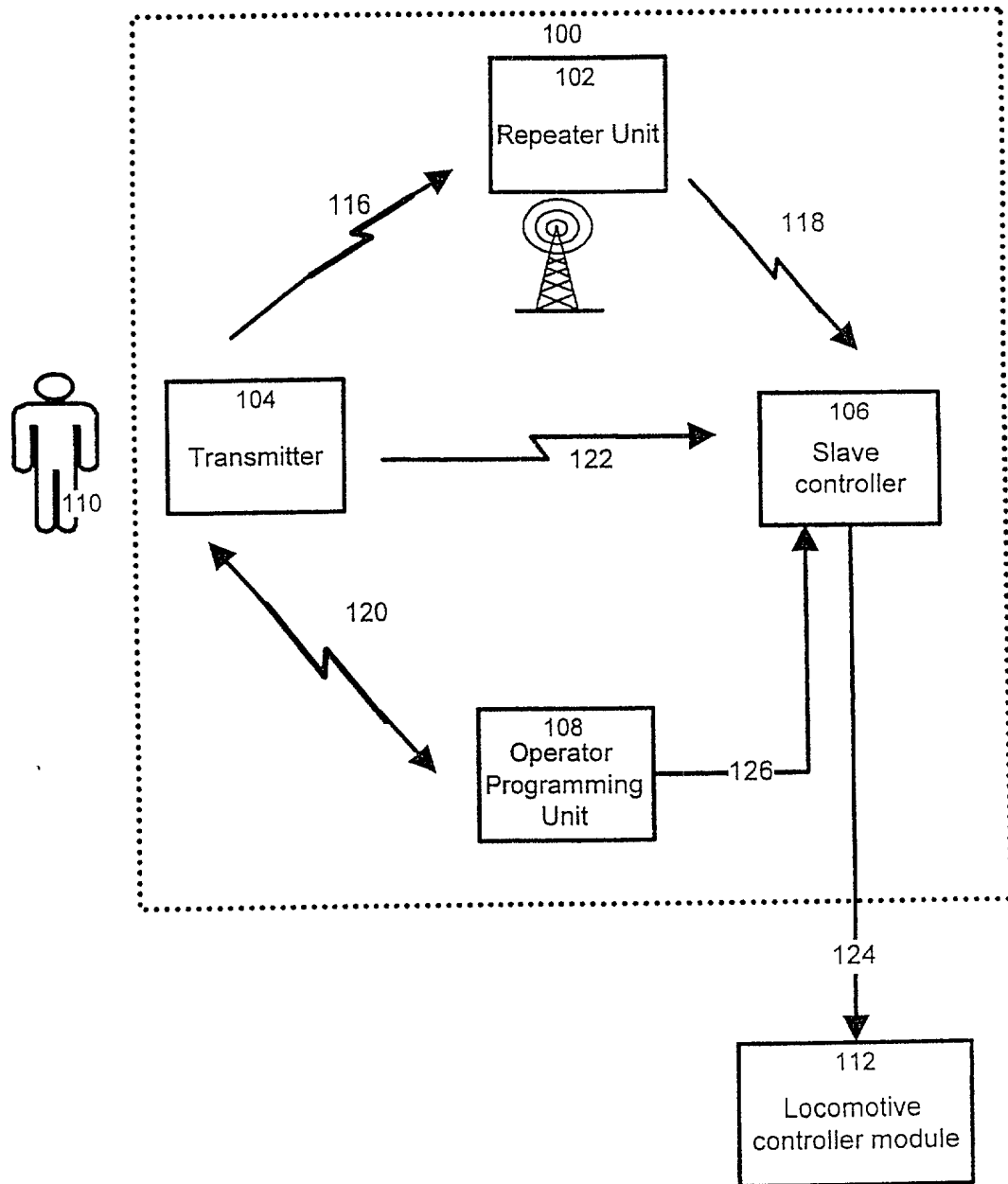


Figure 1

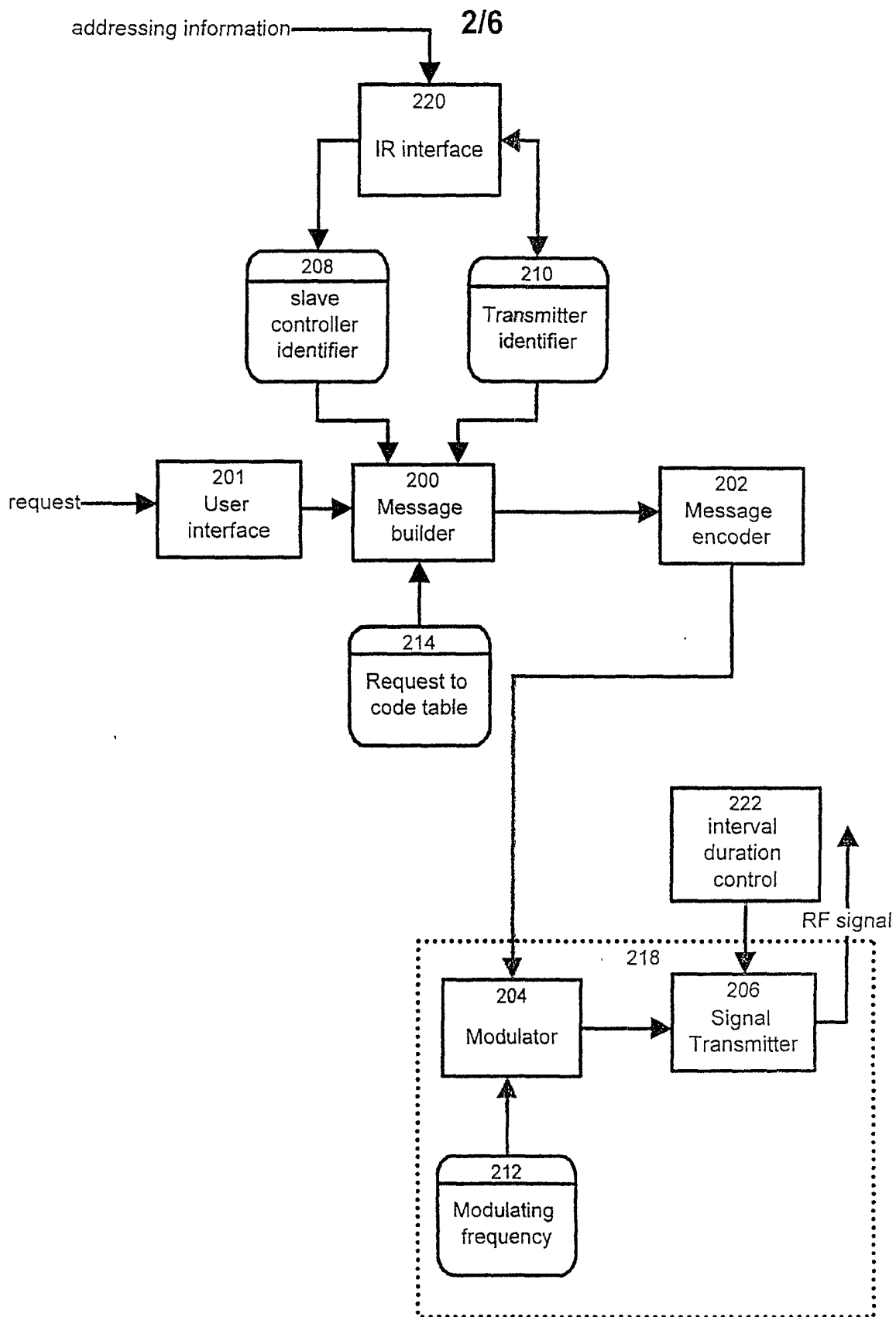


Figure 2

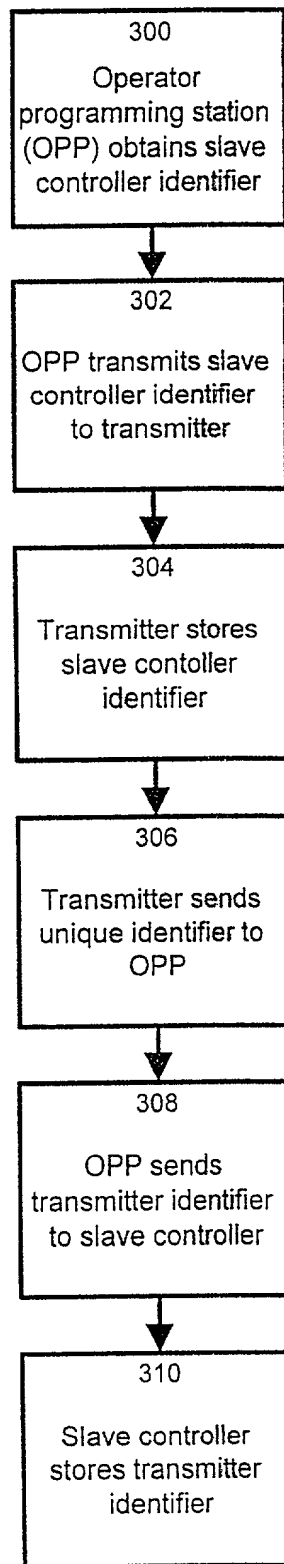


Figure 3

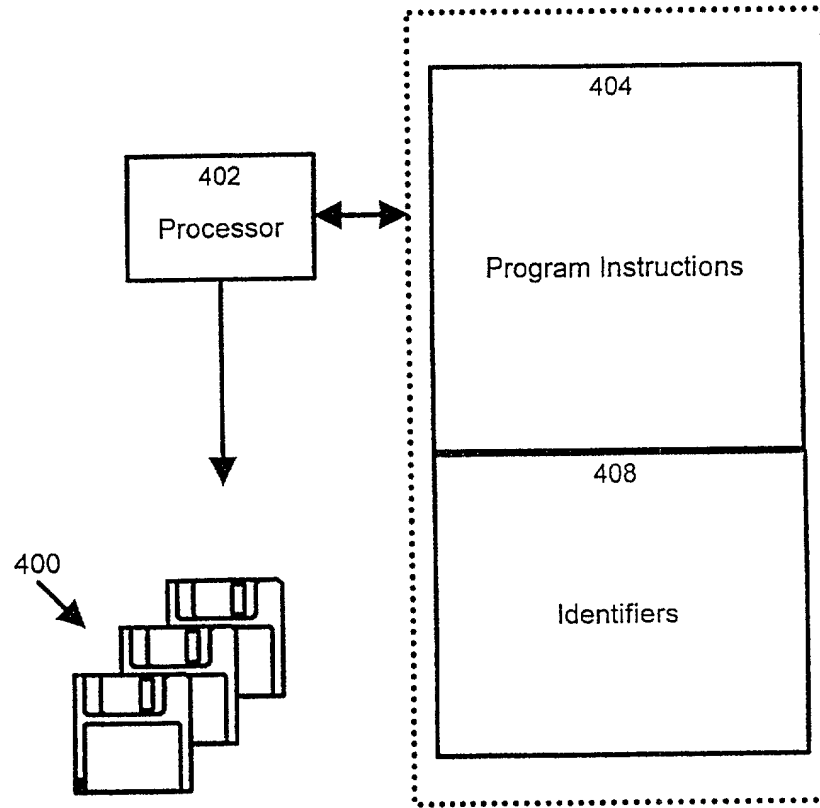


Figure 4

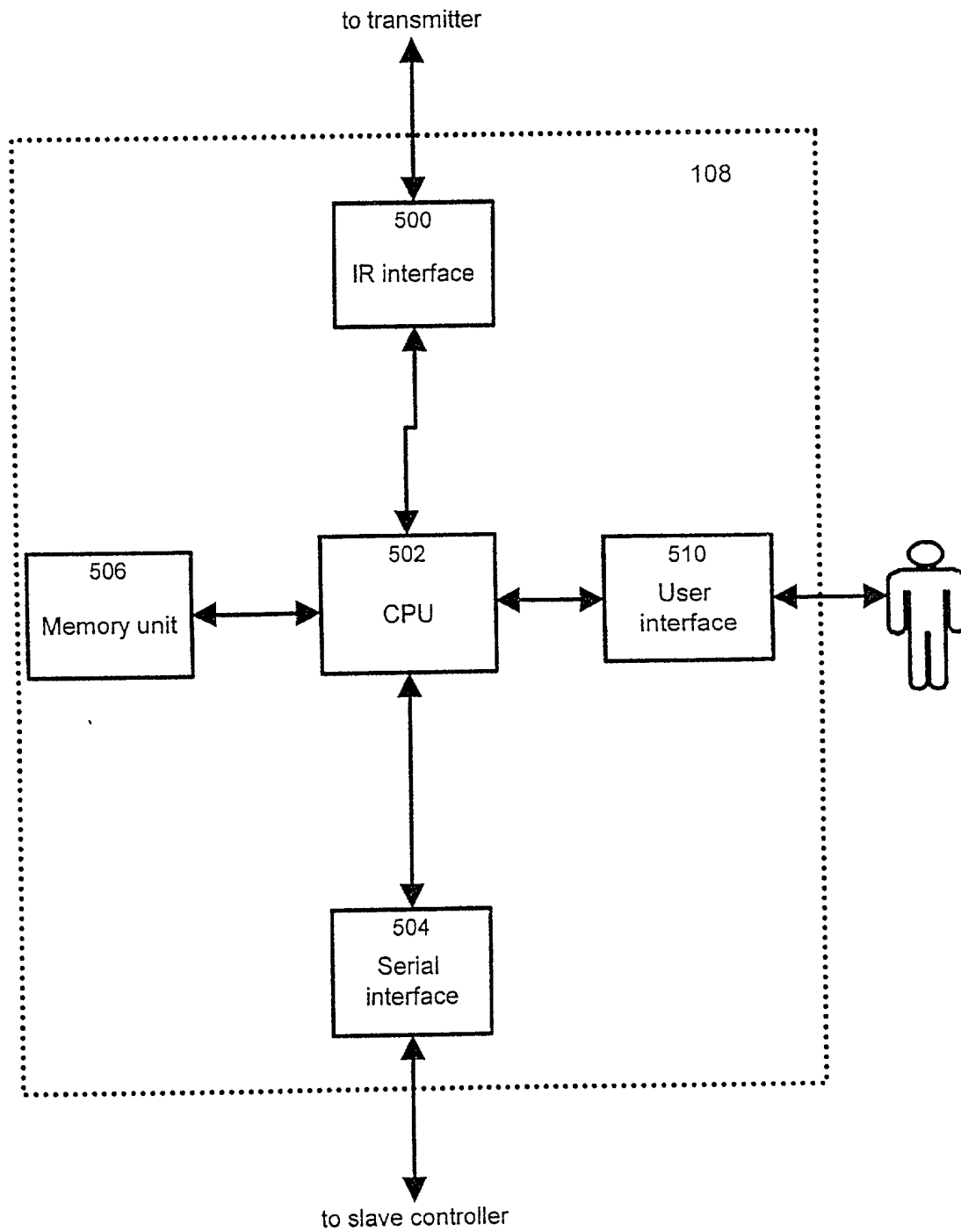


Figure 5

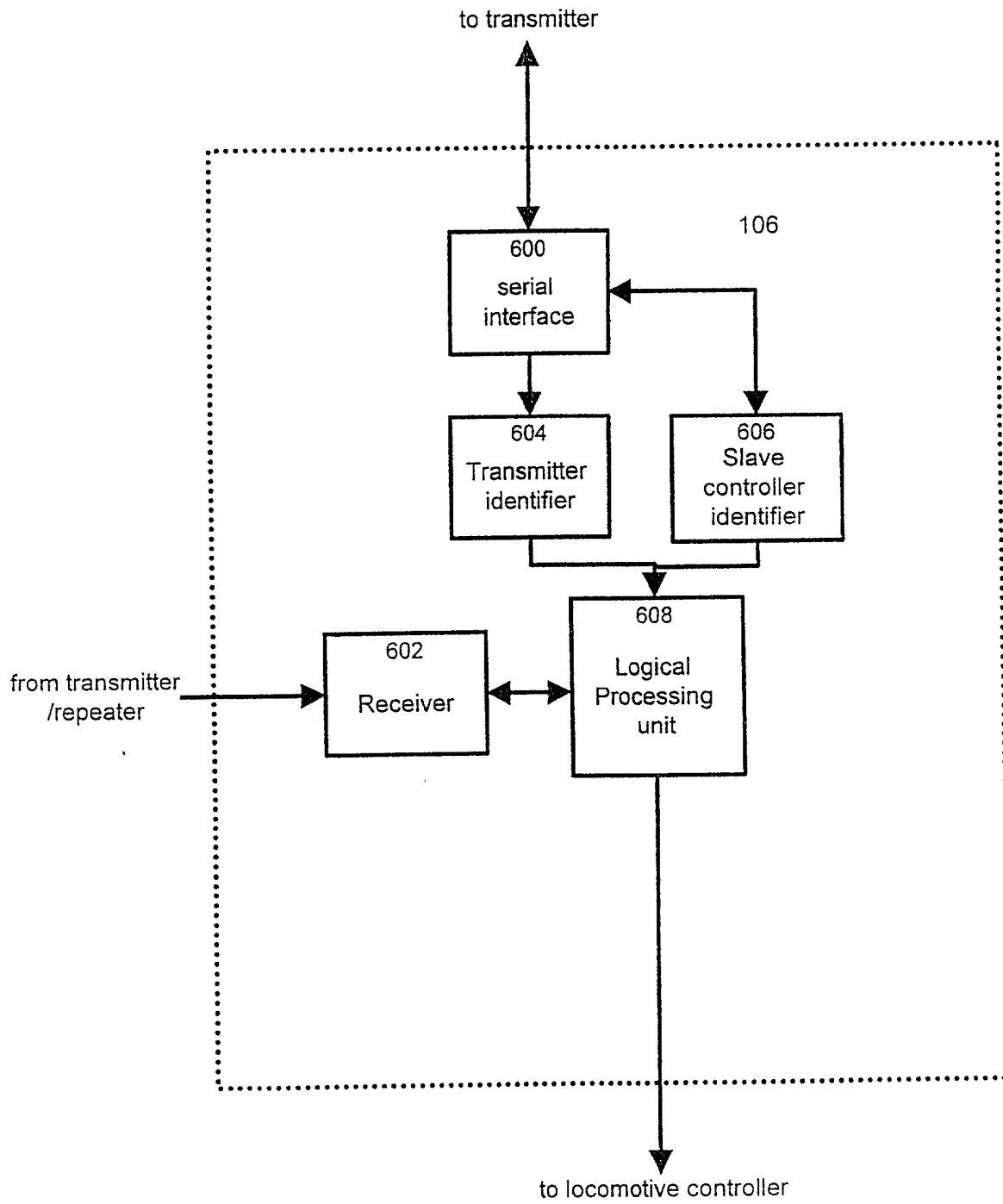


Figure 6

Abstract of the disclosure

The invention relates to a method and an apparatus for remotely controlling device, more particularly to a system and
5 method for controlling locomotives in a railway environment using radio frequency signals. This invention makes use of a remote operator programming unit (OPP) to set address information in the transmitter unit via a communication channel such as an infrared link. The use of the operator programming
10 unit allows eliminating the need to open the casing of the transmitter during programming thereby reducing the probability of damaging the electrical components of the transmitter. The invention also allows assigning a unique address to a transmitter/receiver pair in a remote control system. The
15 invention further provides an apparatus for remotely programming a transmitter unit.

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COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND APPARATUS FOR ASSIGNING ADDRESSES TO COMPONENTS IN A CONTROL SYSTEM

the specification of which (I authorize Choate, Hall & Stewart to check one of the following, three choices, and fill in the blanks, if applicable):

 X is attached hereto

 was filed on as Application
Serial No. and amended on (if applicable).

 was filed as PCT international application No. ,
on and was amended under PCT Article 19
on (if applicable).

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledged the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

Priority Claimed

| | | | | |
|---------------------------|---------------|------------------------|--------------|---------------|
| <u>(not yet received)</u> | <u>Canada</u> | <u>March 25, 1999</u> | <u> X </u> | <u> </u> |
| (Number) | (Country) | (Day/Month/Year/Filed) | Yes | No |

| | | | | |
|-----------------------------|-----------------------------|-----------------------------|---------------|---------------|
| <u> </u> | <u> </u> | <u> </u> | <u> </u> | <u> </u> |
| (Number) | (Country) | (Day/Month/Year/Filed) | Yes | No |

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

| | | |
|-----------------------------------|------------------------|--|
| _____ (Application Serial No.) | _____ (filing date) | _____ (status-patented, pending, abandoned) |
| _____ (Application Serial No.) | _____ (filing date) | _____ (status-patented, pending, abandoned) |

PCT Applications designating the United States:

| | | |
|--------------------------|---------------------|--|
| _____ (PCT Appl. No.) | _____ (U.S.S.N.) | _____ (status-patented, pending, abandoned) |
|--------------------------|---------------------|--|

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national filing date of this application.

Provisional Application(s):

| | | |
|-----------------------------|----------------|-----------------|
| _____ Application Number | _____ Filed | _____ Status |
|-----------------------------|----------------|-----------------|

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:
Brenda Herschbach Jarrell, Reg. No. 39,223; Sam Pasternack, Reg. No. 29,576;
David J. Powsner, Reg. No. 31,868; Paul A. Pysher, Reg. No. 40,780 and
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53 State Street, Boston, Massachusetts 02109-2891.

I hereby declare that all statements made herein of my own knowledge are true and that
all statements made on information and belief are believed to be true; and further that these
statements were made with the knowledge that willful false statements and the like so made are
punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United State
Code and that such willful false statements may jeopardize the validity of the application or any
patents issued thereon.

Full name of first inventor: Folkert Horst

Inventor's signature: _____ Date: _____

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Full name of second inventor: André Brousseau

Inventor's signature: _____ Date: _____

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Full name of third inventor: Oleh Szklar

Inventor's signature: _____ Date: _____

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Full name of fourth inventor: Luc Ethier

Inventor's signature: _____ Date: _____

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Citizenship: Canada

Post Office Address: same